

STUDY OF DIFFERENT TISSUES OF THE BODY

Human Anatomy & Physiology (Theory & Practical)

D.Pharm-I

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Types of Tissues

Learning Objectives

By the end of this section, you will be able to:

- Identify the four main tissue types
- Discuss the functions of each tissue type
- Relate the structure of each tissue type to their function
- Discuss the embryonic origin of tissue
- Identify the three major germ layers
- Identify the main types of tissue membranes

WHAT IS A TISSUE

The term **tissue** is used to describe a group of cells found together in the body. The cells within a tissue share a **common embryonic origin**. Microscopic observation reveals that the **cells in a tissue share morphological features and are arranged in an orderly pattern** that achieves the tissue's functions.

TYPES OF TISSUES

Although there are many types of cells in the human body, they are organized into four broad categories of tissues: **epithelial**, **connective**, **muscle**, and **nervous**.

Each of these categories is characterized by specific functions that contribute to the overall health and maintenance of the body.

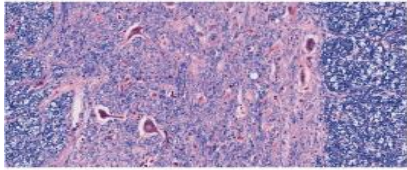
The Four Types of Tissues

Epithelial tissue, also called epithelium, forms the sheets of cells that cover exterior surfaces of the body (skin), lines internal cavities and passageways, and forms certain glands.

Connective tissue, binds the cells and organs of the body together and functions in the protection, support, and integration of all parts of the body.

Muscle tissue is excitable, responding to stimulation and contracting to provide movement, and occurs as three major types: **skeletal (voluntary) muscle**, **smooth muscle**, and **cardiac muscle** in the heart.

Nervous tissue is also excitable, allowing the *propagation of electrochemical signals in the form of nerve impulses* that communicate between different regions of the body.

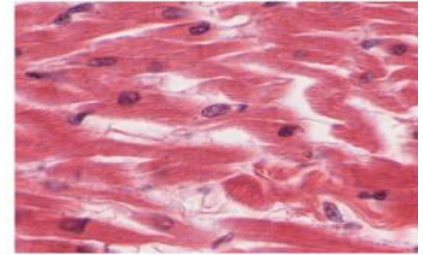
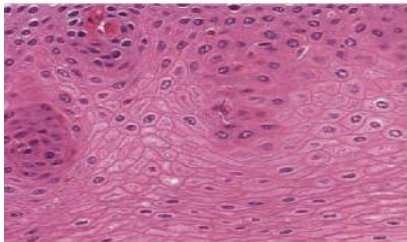


Nervous tissue

- Brain
- Spinal cord
- Nerves

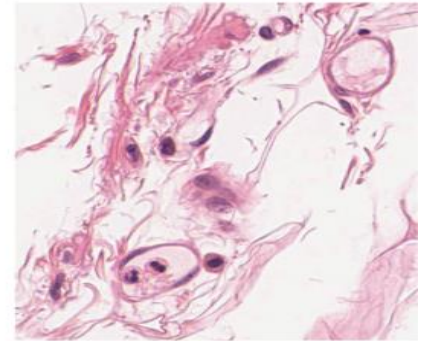
Epithelial tissue

- Lining of GI tract organs and other hollow organs
- Skin surface (epidermis)



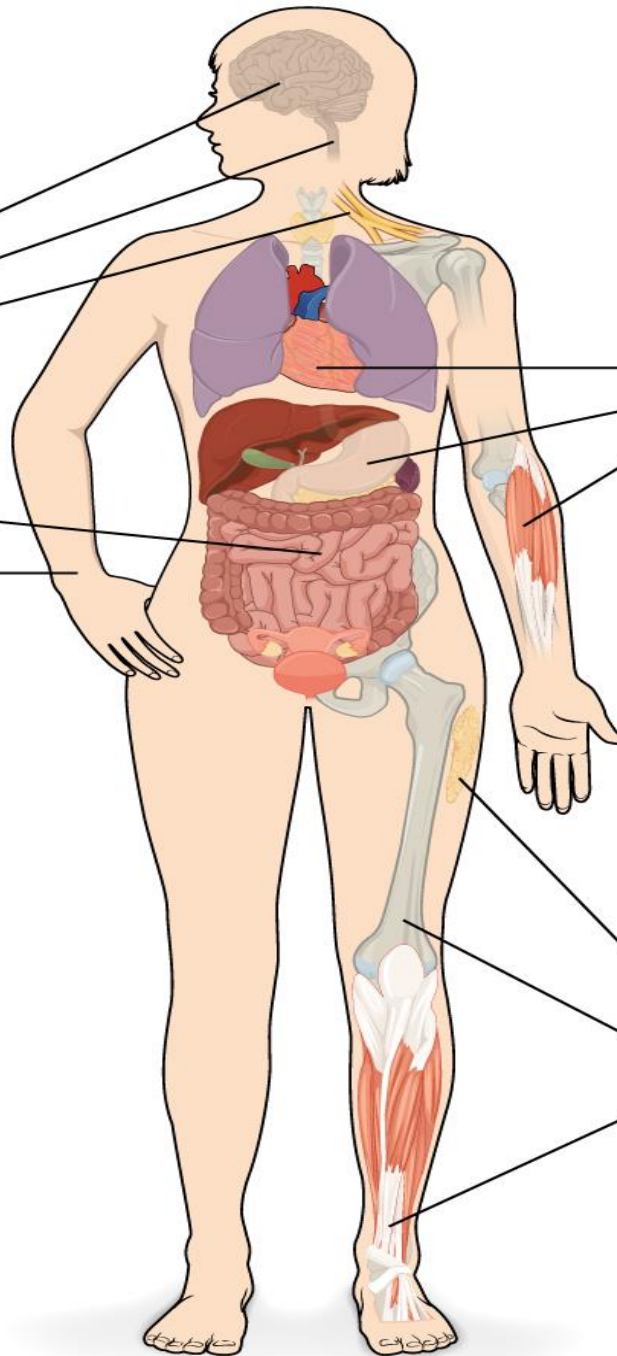
Muscle tissue

- Cardiac muscle
- Smooth muscle
- Skeletal muscle



Connective tissue

- Fat and other soft padding tissue
- Bone
- Tendon



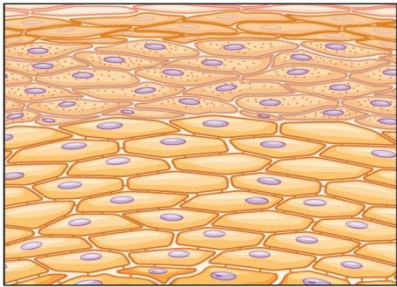

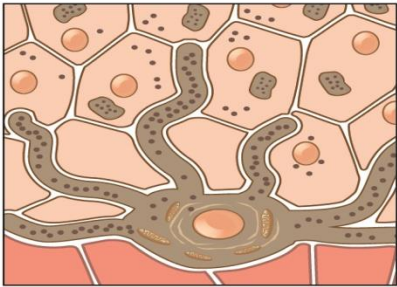
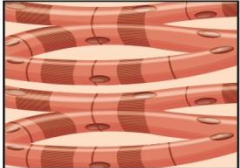



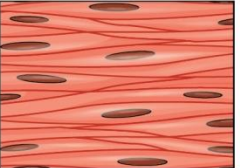
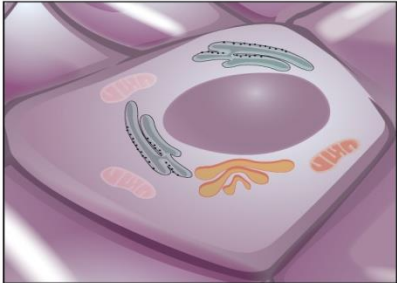
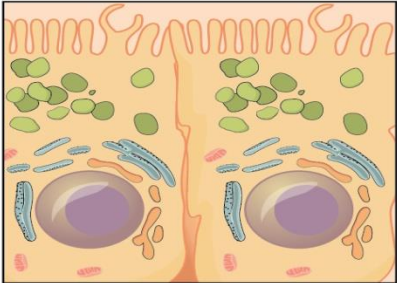
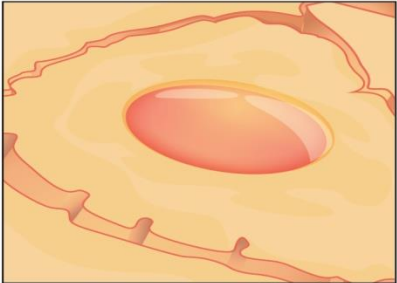
Embryonic Origin of Tissues

The zygote, or fertilized egg, is a single cell formed by the fusion of an egg and sperm.

After fertilization the zygote gives rise to rapid mitotic cycles, generating many cells to form the embryo.

The first embryonic cells generated have the ability to differentiate into any type of cell in the body and, as such, are called **totipotent**, meaning each has the capacity to divide, differentiate, and develop into a new organism.

As cell proliferation progresses, three major cell lineages (germ layers) are established within the embryo. The distinct germ layers form the tissues and organs of the human body. Each germ layer is identified by its relative position: **ectoderm** (ecto- = “outer”), **mesoderm** (meso- = “middle”), and **endoderm** (endo- = “inner”).

Germ Layer	Gives rise to:
Ectoderm	<p data-bbox="490 139 1734 191">Epidermis, glands on skin, some cranial bones, pituitary and adrenal medulla, the nervous system, the mouth between cheek and gums, the anus</p> <div data-bbox="490 225 888 508">  </div> <p data-bbox="625 525 757 548">Skin cells</p> <div data-bbox="915 225 1313 508">  </div> <p data-bbox="1054 525 1174 548">Neurons</p> <div data-bbox="1340 225 1738 508">  </div> <p data-bbox="1456 525 1626 548">Pigment cell</p>
Mesoderm	<p data-bbox="490 596 1711 648">Connective tissues proper, bone, cartilage, blood, endothelium of blood vessels, muscle, synovial membranes, serous membranes lining body cavities, kidneys, lining of gonads</p> <div data-bbox="490 674 730 839">  </div> <p data-bbox="556 856 664 908">Cardiac muscle</p> <div data-bbox="745 674 981 839">  </div> <p data-bbox="807 856 915 908">Skeletal muscle</p> <div data-bbox="996 674 1236 839">  </div> <p data-bbox="1043 856 1190 908">Tubule cell of kidney</p> <div data-bbox="1251 674 1491 839">  </div> <p data-bbox="1298 856 1445 908">Red blood cells</p> <div data-bbox="1506 674 1746 839">  </div> <p data-bbox="1568 856 1676 908">Smooth muscle</p>
Endoderm	<p data-bbox="490 953 1750 1005">Lining of airways and digestive system except the mouth and distal part of digestive system (rectum and anal canal); glands (digestive glands, endocrine glands, adrenal cortex)</p> <div data-bbox="490 1028 888 1308">  </div> <p data-bbox="625 1325 757 1348">Lung cell</p> <div data-bbox="915 1028 1313 1308">  </div> <p data-bbox="1035 1325 1193 1348">Thyroid cell</p> <div data-bbox="1340 1028 1738 1308">  </div> <p data-bbox="1437 1325 1646 1348">Pancreatic cell</p>

Tissue Membranes

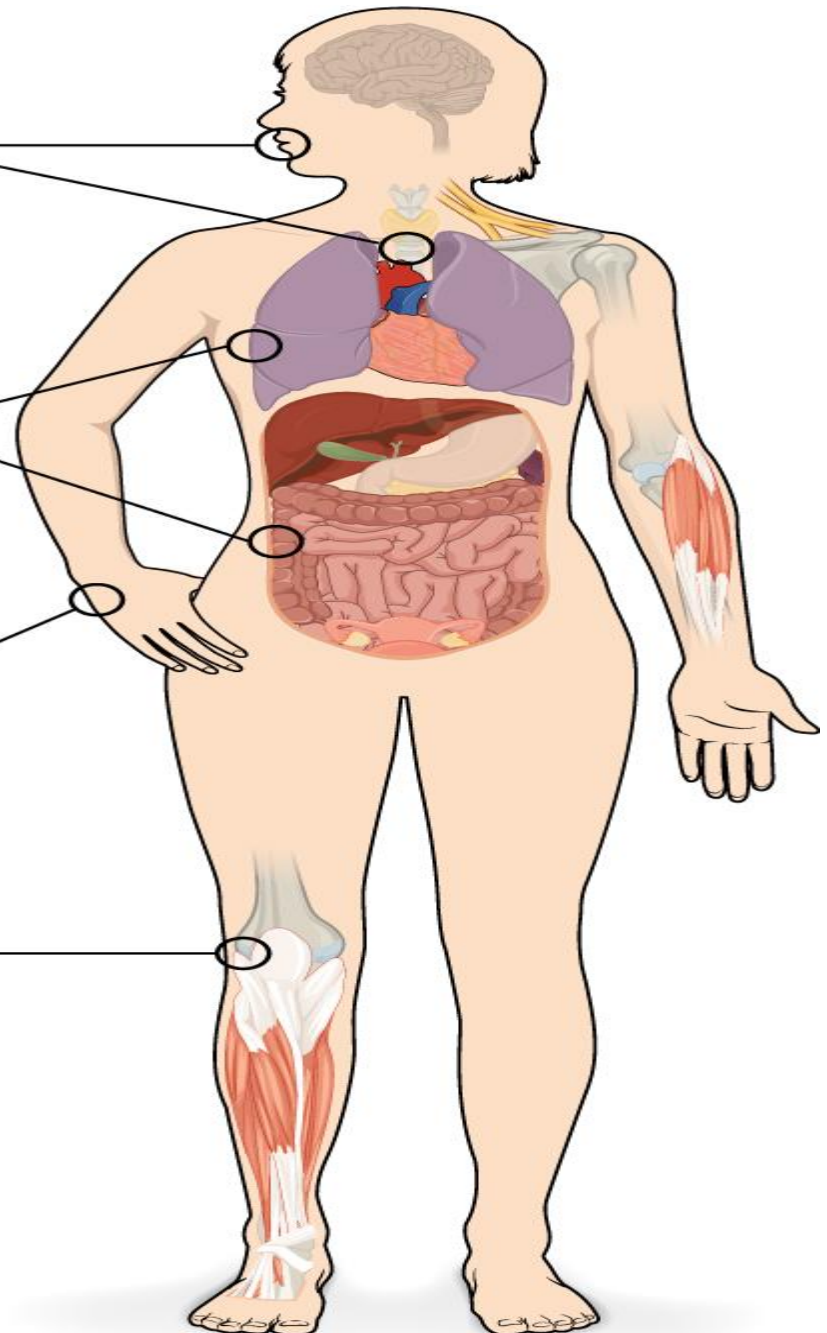
A **tissue membrane** is a thin layer or sheet of cells that covers the outside of the body (for example, skin), the organs (for example, pericardium), internal passageways that lead to the exterior of the body (for example, abdominal mesenteries), and the lining of the moveable joint cavities. There are two basic types of tissue membranes: **connective tissue** and **epithelial** membranes

Mucous membranes line the digestive, respiratory, urinary, and reproductive tracts. They are coated with the secretions of mucous glands.

Serous membranes line body cavities closed to the exterior of the body: the peritoneal, pleural, and pericardial cavities.

Cutaneous membrane, or the skin, covers the body surface.

Synovial membranes line joint cavities and produce the fluid within the joint.



Connective Tissue Membranes

The **connective tissue membrane** is formed solely from connective tissue. These membranes encapsulate organs, such as the kidneys, and line our movable joints.

A **synovial membrane** is a type of connective tissue membrane that lines the cavity of a freely movable joint. For example, synovial membranes surround the joints of the shoulder, elbow, and knee.

Fibroblasts in the inner layer of the synovial membrane release hyaluronan into the joint cavity. The hyaluronan effectively traps available water to form the synovial fluid, a natural lubricant that enables the bones of a joint to move freely against one another without much friction. **This synovial fluid readily exchanges water and nutrients with blood**, as do all body fluids.

Epithelial Membranes

The **epithelial membrane** is composed of epithelium attached to a layer of connective tissue, for example, your skin.

The **mucous membrane** is also a **composite of connective and epithelial tissues**. Sometimes called *mucosae*, these epithelial membranes line the body cavities and hollow passageways that open to the external environment, and include the digestive, respiratory, excretory, and reproductive tracts

Mucous, produced by the epithelial exocrine glands, covers the epithelial layer. The underlying connective tissue, called the **lamina propria** (literally “own layer”), help support the fragile epithelial layer.

Serous Membrane

A **serous membrane** is an epithelial membrane composed of mesodermally derived epithelium called the mesothelium that is supported by connective tissue.

Serous membranes are identified according to locations. **Three serous membranes line the thoracic cavity**; the **two pleura** that cover the lungs and the **pericardium** that covers the heart. A fourth, the **peritoneum**, is the serous membrane in the abdominal cavity that covers abdominal organs and forms **double sheets of mesenteries** that suspend many of the digestive organs.

The skin is an epithelial membrane also called the **cutaneous membrane**. It is a stratified squamous epithelial membrane resting on top of connective tissue. The apical surface of this membrane is exposed to the external environment and is covered with dead, keratinized cells that help protect the body from desiccation and pathogens.

CLASS REVIEW

The human body contains more than 200 types of cells that can all be classified into four types of tissues: epithelial, connective, muscle, and nervous.

Epithelial tissues act as coverings controlling the movement of materials across the surface

Connective tissue integrates the various parts of the body and provides support and protection to organs.

Muscle tissue allows the body to move. Nervous tissues propagate information.

The study of the shape and arrangement of cells in tissue is called histology. All cells and tissues in the body derive from three germ layers in the embryo: the ectoderm, mesoderm, and endoderm.

Different types of tissues form **membranes** that enclose organs, provide a friction-free interaction between organs, and keep organs together.

Synovial membranes are connective tissue membranes that protect and line the joints. Epithelial membranes are formed from epithelial tissue attached to a layer of connective tissue.

There are three types of epithelial membranes: **mucous**, which contain glands; **serous**, which secrete fluid; and **cutaneous** which makes up the skin.